

First, the Office Action has not shown, and Applicants have not found, any teaching or suggestion in the prior art to combine these teachings. Since there is no teaching or suggestion to combine these references, the Office Action must be relying on a compelling motivation.¹

A. The Office Action does assert the motivation that the metal silicate deposition process is much simpler than Hori '766's silicon oxynitride approach. Applicants disagree with this conclusion.

Hsieh '035 does state that "It is an object of this invention to provide a simple process for making an insulating material having a substantially higher dielectric constant than that of silicon dioxide and low current leakage characteristics . . ." However, upon reading the entire patent, ordinary artisans would understand that this process was simple—but only relative to the known processes for forming useful storage dielectrics with transition metal oxides². Hsieh '035 describes several methods for forming storage dielectrics, but none of these appears to be "extremely simple". Applicants strongly disagree with the assertion that Hsieh '035's process is simpler than forming silicon dioxide.

For example, Hsieh '035's first method involves depositing a layer of tantalum silicide 12 on the substrate 10. Illustrated techniques included vacuum deposition onto the substrate 10 by evaporating both tantalum and silicon with known dual electron beam techniques and sputtering. After the tantalum silicide alloy layer 12 has been deposited, the alloy is oxidized, preferably in dry oxygen, at a temperature of about 400 degrees C or higher for several minutes or more until all of the alloy is converted into a silicate layer 12' which includes a mixture of tantalum oxide (Ta_2O_5) and silicon dioxide (SiO_2).³

In a similar vein, Hori '766 praises the simplicity of his method. "[A]ccording to the present invention, an insulating film providing a high mobility can be obtained by an extremely simple method."⁴ In particular, Hori '766 teaches forming a standard thermal oxide followed by

¹ "Before obviousness may be established, the examiner must show that there is either a suggestion in the art to produce the claimed invention or a compelling motivation based on sound scientific principles." -- Ex parte Kranz, 19 U.S.P.Q. 2d 1216 (Bd. Pat. App. & Inter. 1990).

² Hsieh '035's background section details some of the difficulties in forming transition metal oxide storage capacitors. See col. 1, ll. 23 - 35.

³ See Hsieh '035 col. 2, line 60 - col. 3, line 10.

⁴ See Hori '766 col. 6, line 17.

a conversion: "The thermal oxide film 2 is converted into a oxynitride film 3, as shown in FIG. 1c, by heating in an atmosphere of ammonia gas for a short time by the use of a short-time heating furnace."⁵ Although this method is slightly more complicated than a standard thermal oxide, ordinary artisans understand that Hori '766's method is not a complicated method.

Given the relevant complexities of the two methods, Applicants submit that most artisans would find Hori '766's method somewhat simpler than Hsieh '035's method. Applicants strongly submit that ordinary artisans would not have a compelling motivation to switch from Hori '766's known, simple approach to a combination involving Hsieh '035's method.

B. Additionally, Hori had a choice about whether to spend the effort to develop his useful method for forming gate dielectrics, or to use Hsieh '035's high dielectric constant storage dielectric in a gate dielectric application. Hsieh '035 had been issued for about 10 years when Hori filed his application. A likely reason for an artisan of at least ordinary skill to not pursue an approach similar to Applicants' is that Applicants' approach was not obvious.

C. Applicants also submit that even if an ordinary artisan found it obvious to try the postulated combination, there is no evidence cited that an ordinary artisan would believe⁶ that Hsieh '035's dielectrics for integrated memory circuits⁷ would be useful as superior gate dielectrics. Applicants submit that ordinary gate dielectric artisans understand that gate dielectric designs must take into account several properties (e.g., interface state, electron mobility, band offsets) that are not usually a primary concern for memory storage capacitor⁸ designs. Thus, Applicants submit that the cited references do not indicate that an ordinary artisan would have a reasonable expectation that the Office Action's postulated combination would succeed.⁹

Applicants submit that all of Applicants' claims are patentable over the cited art, because the references—taken together—would not have suggested the invention to those of ordinary skill in the art.

⁵ See Hori '766 col. 6, line 17.

⁶ Without the benefit of the insight provided by the instant application

⁷ See Hsieh '035 col. 6, line 37.

⁸ See Hsieh '035 col. 3, line 30.

⁹ "*Obviousness does not require absolute predictability, but a reasonable expectation of success is necessary.*" -- In Re Clinton, 188 U.S.P.Q. 365 (CCPA, 1976).

2. Regarding the remaining claims, Applicants submit that neither the Gardner *et al.* patent nor the Leas *et al.* patent cure the deficiencies noted above.
3. Applicants believe that the application is in condition for allowance. If Examiner has any further comments or suggestions, Applicants respectfully request that Examiner contact the undersigned in order to expeditiously resolve any outstanding issues.

Respectfully submitted,



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